REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 20 and 22-28 are presently active in this case, Claim 20 having been amended, Claims 1-19 and 21 having been canceled, and Claims 22-28 added by the present amendment.

In the outstanding Office Action, the abstract was objected to because of inclusion of legal phraseology and Claims 20 and 21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Junichi et al. (JP 2000-224593, hereinafter "Junichi") in view of Hazra et al. (U.S. Patent No. 6,594,313, hereinafter "Hazra").

In response to the objection to the abstract, the "legal" phrase "comprises" has been changed to –includes--. Accordingly, the objection to the abstract is believed to have been overcome.

In light of the outstanding ground for rejection, Claim 20 has been amended to clarify the claimed invention and thereby more clearly patentably define over the cited prior art. New Claims 22-28 defining a varied scope of protection have also been added. To minimize cost to Applicants, Claims 1-19 have been canceled without prejudice. Support for the claim amendments is found in the original claims and in the specification, for example, at page 19, line 22 to page 21, line 25, page 38, line 18 to page 41, line 26. No new matter has been added.

Amended Claim 20 recites, in part,

> Claim 20. A method of detecting a motion vector comprising:
> (a) extracting, from a (m+k)-th frame assumed between a m-th frame (m is an integer) of an image formed of a plurality of pixels and a (m+n)-th frame (n is an integer not less than k + 1, k is a real number), a plurality of first blocks produced by dividing the (m+k)-th frame and each having a given size and a given shape; ...

(h) extracting a first pair of blocks each containing pixels for which the first count value becomes maximum, from the second blocks and the third blocks to obtain a vector between the first pair of blocks as a motion vector for every first region between the m-th frame and the (m+n)-th frame; ...

(j) extracting pixels in the second blocks for which the first absolute difference value is more than the second threshold as pixel blocks of a second region;

(k) extracting fourth blocks identical in size and shape to the pixel blocks of the second region from the (m+n)-th frame;

(l) obtaining each second absolute difference value between opposite pixels of the pixel blocks of the second region and the fourth blocks;

(m) counting pixels having the second absolute difference value not more than a third threshold to obtain second count values; and

(n) extracting a second pair of blocks each including pixels for which the second count value becomes maximum from the pixel blocks of the second region and the fourth blocks to obtain a vector between the second pair of blocks as a motion vector for every second region between the second region and the (m+n)-th frame.

As evident from amended Claim 20, according to Applicants' invention an interpolation frame ((m+k)-th) assumed between a m-th frame and a (m+n)-th frame is divided into a plurality of first blocks, and the first blocks are divided into first and second regions. A vector between a first pair of blocks from the second blocks and the third blocks is obtained as a motion vector for every first region between the m-th frame and the (m+n)-th frame, and a vector between a second pair of blocks from the pixel blocks of the second region and the fourth blocks is obtained as a motion vector for every second region between the second region and the (m+n)-th frame. More specifically, the vector with respect to the first region and the vector with respect to the second region are detected. As a result, occurrence of the block distortion can be prevented.

Hazra discloses a method for block motion estimation including the steps of obtaining three vectors, including a motion vector FMV obtained by searching for a vector from a first frame to a second frame, a motion vector BMV obtained by searching for a vector from the second frame to the first frame and a motion vector ZERO MV indicating no motion. Hazra then teaches selecting an optimum one from the vectors. The method for obtaining the three

vectors is executed for the entire frame and then a vector passing through a certain block on an interpolation frame is determined. Then, the motion vector is selected as a best motion vector for which an absolute difference value is small in comparison with another motion vector (see Figs. 5 and 8).

In contrast to Hazra, according to the claimed invention, since each block on the interpolation frame is divided into first and second regions, the block shape of the second region varies for each block. The vector is searched for based on the varying shape of the block.

Junich teaches searching for a motion vector for the second region R2. However, cited Claim 1 recites a step of calculating a relation between a distribution state of pixels composing the second region and the direction of the first motion vector with reference to the second region. The distribution state recited herein is for obtaining a positional relation between the center of the block and the noncoincidence pixel. This distribution state is used only for calculating an inner product with respect to the first motion vector when occlusion is determined. Further, cited Claim 1 recites a step of obtaining a second motion vector by detecting a motion vector between the critical region and the researched reference frame. However, cited claim 1 does not recite searching for a motion vector based on the shape of the second region R2. In other words, according to Junich, the searching is done by determining an occlusion region and then determining a searching direction. Junich does not consider processing for a region of not-occlusion.

Since the Applicants' invention searches a frame regardless of occlusion, no process for determining a searching direction is needed.

As described above, neither Hazra nor Junich teaches the subject matter of amended Claim 20. Accordingly, it is respectfully submitted that amended Claim 20 patentably defines over Hazra and Junich. Claim 22 dependent on Claim 20 is therefore also believed to

patentably define over the cited prior art. Likewise, independent Claims 23, 25, and 27 include substantially similar subject matter as recited in amended Claim 20. Accordingly, Claims 23, 25, and 27 are also believed patentably distinguishing over the cited prior art, as well as dependent Clams 24 and 26 dependent on Claims 23 and 25, respectively.

Consequently, in view of the present amendment and in light of the above comments, no further issues are believed to be outstanding, and the present application is believed to be in condition for allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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